COURSE OUT LINE
FIRST PROFESSIONAL

Paper-1 PHARMACEUTICAL CHEMISTRY-I (ORGANIC) 100 Marks

The topics will be taught with special reference to their Pharmaceutical Applications.

1. BASIC CONCEPTS: Conjugation, hyperconjugation, steric effect, inductive effect, mesomeric effect, hydrogen bonding, Theory of resonance. Effect of structure on reactivity of compounds. Tautomerism of carbonyl compounds.
2. NUCLEOPHILIC AND ELECTROPHILIC SUBSTITUTION REACTION IN ALIPHATIC AND AROMATIC SYSTEMS.
3. ORIENTATION IN ELECTROPHILIC SUBSTITUTION REACTIONS ON BENZENE RING.
4. ORGANIC REACTIONS: Baeyer-Villiger oxidation; Diels Alder reaction; Grignard’s reaction, Metal hydride reduction and Wolf Krishner reduction, Friedel Craft’s reaction, Perkin reaction, Cannizzaro reaction.
6. CARBANIONS: Condensation reaction (Aldol condensation; Favorskii rearrangement; Witting reaction).
7. STEREOCHEMISTRY: Stereoisomerism, optical isomerism; Molecules with more than one chiral centre. Geometrical isomerism, Resolution of racemic mixture. Conformational analysis.


11. PREPARATION AND PROPERTIES OF HETEROCYCLIC COMPOUNDS in which benzo-ring is fused with five and six member ring containing one heteroatom; Indole, Quinoline and Isoquinoline.
**Lab. PHARMACEUTICAL CHEMISTRY-I (ORGANIC) 100 Marks**

**NOTE:** - Practical of the subject shall be designed from time to time on the basis of the above mentioned theoretical topics and availability of the facilities, e.g.


2. Organic Preparations: Benzoic acid, Aspirin, Acetanilide, Iodoform, Nitrophenol, 3-nitrophthalic acid, Benzhydrol and 2,4-Dinitrochlorobenzene.

**Paper 2 PHARMACEUTICAL BIOCHEMISTRY 100 Marks**

1. **GENERAL INTRODUCTION AND BASIC BIOCHEMICAL PRINCIPLES**
   Role of pharmaceutical Biochemistry in the health Profession. Nature of Biochemical reactions

2. **BASIC CHEMISTRY OF BIOMOLECULES (Nature, Classification etc.)**
   (a) Carbohydrates: Chemistry, Classification, Reactions of Carbohydrates, Optical activity, Biological and pharmaceutical importance of carbohydrates.
   (b) Lipids: Chemistry of Fatty acids and Lipids, Classification (Saponifiable and non-saponifiable lipids, Simple, Complex and derived lipids), Reactions of Fatty acids and other Lipids, Essential fatty acids, Biological and pharmaceutical importance of lipids.
   (c) Proteins and Amino acids: Chemistry, Classification of proteins and amino acids, Reactions of proteins and amino acids, Organizational levels, Macromolecular nature of proteins, Biological and pharmaceutical importance of proteins and amino acids.
   (d) Nucleic acids: Chemistry, Types (DNA, RNA, mRNA, tRNA, rRNA), Purine and Pyrimidine bases, Nucelosides, Nucelotides, Structures of nucleic acids, Biological and pharmaceutical importance of nucleic acids.
   (e) Vitamins: Chemistry, Classification (Fat-soluble and water-soluble vitamins), Biological and pharmaceutical importance of vitamins.
   (f) Hormones: Chemistry, Classification (Proteinous and nonproteinous hormones, amino acid derivatives, steroids), Biological and pharmaceutical importance of hormones.
(g) Enzymes: Chemistry, Classification, Mode of action, Kinetics (Michaelis Menten Equation and some modifications), Inhibition, Activation, Specificity, Allosteric enzymes, Factors affecting the rate of an enzyme-catalyzed reaction, Biological and pharmaceutical importance, Mechanism of action of some important enzymes (Chymotrypsin, Ribonuclease).

3. METABOLIC FATE OF BIOMOLECULES (Anabolism and Catabolism)

(a) Carbohydrates: Introduction to metabolism, Brief introduction to the digestion and absorption of carbohydrates, Aerobic and anaerobic breakdown of Glucose, Glycolysis, Pentose Phosphate Pathway, Glyclogenolysis, Glycogenesis, Gluconeogenesis, Citric acid cycle, Energetics of various metabolic processes.

(b) Lipids: Brief introduction to the digestion and absorption of lipids, Oxidation of fatty acids through b-oxidation, Biosynthesis of fatty acids, neutral lipids and cholesterol.

(c) Proteins and Amino acids: Brief introduction to the digestion and absorption of proteins and amino acids, Metabolism of essential and non-essential amino acids, Biosynthesis and catabolism of Haemins and porphyrin compounds.


4. REGULATION OF METABOLIC PROCESSES

(a) Role of Vitamins: Physiological role of Fat-soluble (A, D, E and K) and Water-soluble (Thiamin, Riboflavin, Pantothenic acid, Niacin, Pyridoxal phosphate, Biotin, Folic acid, Cyanocobalamin members of B-complex family and Ascorbic acid), Coenzymes and their role in the regulation of metabolic processes.

(b) Receptor mediated regulation (Hormones): Mechanism of action of hormones, Physiological roles of various hormones, Site of synthesis and target sites of hormones.

(c) Secondary Messengers: Role of cAMP, Calcium ions and phosphoinositol in the regulation of metabolic processes.
(d) Gene Expression: Replication, Transcription and Translation (Gene expression) Introduction to Biotechnology and Genetic Engineering, Basic principles of Recombinant DNA technology, Pharmaceutical applications, Balance of Catabolic, Anabolic and Amphibolic processes in human metabolism, Acid-Base and Electrolyte Balance in Human body.

Lab.  PHARMACEUTICAL BIOCHEMISTRY (PRACTICAL)  100 Marks

1. Qualitative analysis of: Carbohydrates, Proteins, Lipids and Sterols (Cholesterol) Bile salts and billirubin, Blood analysis — Cholesterol and Creatinine. Amino acids, Peptides and Sugar, Uric acid, Billirubin,
2. **Quantitative analysis of:** Carbohydrates — Glucose (reducing sugar) and any other carbohydrate using Benedict and Anthrone method, Amino acids, Peptides and Proteins using Biuret and Ninhydrin (Spectrophotometric) method. Analysis of normal and abnormal components of Urine — Sugar, Uric acid, Bilirubin, Cholesterol and Creatinine.

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**Paper 3 PHARMACEUTICS-I (PHYSICAL PHARMACY) Marks 100**

1. **PHARMACY ORIENTATION:**
   Introduction and orientation to the Professional of Pharmacy in relation to Hospital Pharmacy, Retail Pharmacy, Industrial Pharmacy, Forensic Pharmacy, Pharmaceutical education and research etc.

2. **HISTORY AND LITERATURE OF PHARMACY:**
   (a) A survey of the history of pharmacy through ancient, Greek and Arab periods with special reference to contribution of Muslim scientists to pharmacy and allied sciences.

   (b) An introduction of various official books.

3. **PHYSICO-CHEMICAL PRINCIPLES:**

   a. Solutions: Introduction, types, concentration expressions, ideal and real solution, colligative properties, their mathematical derivations and applications in pharmacy, molecular weight determinations, distribution co-efficient and its applications in pharmacy.

   b. Solubilization: Solubility, factors affecting solubility, surfactants, their properties and types. Micelles, their formulation and types.

   c. Ionization, pH, pH indicators, pKa, buffers, buffer’s equation, Isotonic solutions and their applications in pharmacy.

   d. Hydrolysis, types and protection of drugs against hydrolysis.

   e. Micromeritics: Particle size and shapes, distribution of particles methods of determination of particle size and importance of particle size in Pharmacy.

4. **DISPERSIONS:**

   (a) Colloids: Types, methods of preparation, properties (optional, kinetic, electrical) Dialysis and artificial kidney, stability of colloids, protection and sensitization phenomenon and application of colloids in Pharmacy.
Emulsions: Types, theories of emulsification, Emulsifying agents their classification and stability of emulsion.

Suspensions: Type, Methods of Preparation, Properties, Suspending agents, their classification and stability.

Adsorption: Techniques and processes of adsorption in detail.

5. RHEOLOGY:

Definition and Fundamental concept.

Properties contributing to Rheological behaviour.

Graphic presentation of Rheological data.

6. PHYSICOCHEMICAL PROCESSES:

(a) Precipitation: Process of precipitation and its applications in Pharmacy.

(b) Crystallization: Types of crystals, Mechanism and methods of crystallization and its applications in Pharmacy.

(c) Distillation. Simple, fractional, steam distillation, vacuum distillation, destructive distillation and their applications in Pharmacy.

(d) Miscellaneous Processes: Efflorescence, deliquesence, lyophilization, elutrition, exiccatio, ignition, sublimation, fusion, calcination, adsorption, decantation, evaporation, vaporization, centrifugation, dessication, levigation and trituration.

7. RATE and ORDER OF REACTIONS.

8. KINETIC PRINCIPLES AND STABILITY TESTING: THEORETIC CONSIDERATIONS: Degradation:


(b) Chemical Factors: Complex chemical reactions. Oxidation-reduction, hydrolysis
Lab.  PHARMACEUTICS-I (PHYSICAL PHARMACY)  Marks 100

NOTE:- Practicals of the subject shall be designed from time to time on the basis of the above mentioned theoretical topics and availability of the facilities, e.g.

1. Experiments to demonstrate some of physico-chemical processes like simple distillation, steam distillation, crystallization, Dialysis.

2. Determination of Emulsion systems.

3. Determination of particle size.

4. Preparation of Buffer solutions and isotonic solution.

5. Determination of %age composition of solutions by specific gravity method.

6. Partition-coefficient, surface tension, viscosity.

Paper 4  PHYSIOLOGY & HISTOLOGY  100 Marks


4. SKIN: Structure, Functions of skin, Temperature regulation by Skin.
5. DIGESTIVE SYSTEM: Mastication, Deglutation, Digestive juices-saliva, Gastric juice, pancreatic juice. Bile and intestinal juices; their composition, Functions and mechanism of secretion, Movements of the stomach and intestines. Functions of large intestine. Defecation. Functions of liver and gall bladder.


Descending tracts of spinal cord. Basal ganglia, Cerbellum. Autonomic Nervous system. Thalamus. CSF.

9. SPECIAL SENSE: Elementary knowledge of structure and function of the special senses.


(a) Pituitary Hormones: Growth Hormone, Prolactin, ACTH, TSH, ADH, Oxytocin. Acromegaly, Giantism, PanHypopituitrism.

(b) Thyroid Gland: Thyroxin, Tri-iodothyronin, Format and functions of thyroid hormones. Hyperthyroidism, Myxocdene.

(c) Parathyroid Hormone.

(d) Pancreatic Hormone: Insulin, Glucagon, Diabetes mellitis.

(e) Adrenal Glands: Mineralocorticoids, Glucocorticoids, Anabolic Steroids, Adrenalin, Nor-adrenalin, Cushing syndrome, Addison disease.

(f) Sex Hormones: Male Sex Hormone, structure and function. Female Sex Hormone: Structure and function.

HISTOLOGY:

(a) Underlying principles of histological techniques and staining specific tissues should be explained.
(b) Staining of paraffin and frozen sections will be given to the students.
(c) Most of the teaching should be done on stained and mounted sections and every type of normal tissue will be covered.
Lab. PHYSIOLOGY & HISTOLOGY (PRACTICAL) 100 Marks

NOTE: - Practicals of the subject shall be designed from time to time on the basis of the above mentioned theoretical topics and availability of the facilities, e.g. Experimental Physiology includes:

1. BLOOD: Determination of Haemoglobin (Hb), Determination of ESR, RBC Count, WBC Count, DLC (Differential Leucocyte Count), Bleeding Time, Coagulation Time and Blood groups.

2. RESPIRATION: Estimation of vital capacity and its relation to posture and standard vital capacity, Determination of Tidal volume and Demonstration of Artificial Respiration.

3. CARDIOVASCULAR SYSTEM: Recording of Arterial Pulse, Recording of Arterial Blood Pressure and Electro-cardiogram.

4. EYE: Visual activity, far vision, near vision and Field of vision (Perimetry).

5. CENTRAL NERVOUS SYSTEM: Nerve Muscle Preparation in frog, Effect of Temperature on muscle and Demonstration of spinal reflexes.

Histology:

1. Demonstration of the preparation of slides.
2. Histological examination of slides- Epithelium, Muscles, Connective Tissues, Gall Bladder, Stomach

Paper 5 ANATOMY Marks 100

1. INTRODUCTION: ANATOMICAL TERMINOLOGY. Definition. Cell, tissue, organ system.


3. TISSUE OF BODY: Types of tissues with examples

(b) Cardiac

4. INTEGUMENTARY SYSTEM:

(a) Skin — Structure (Epidermis, dermis).
(b) Glands of Skin, (Sweat, Sebaceous).
(c) Hair — Structure, function.
(d) Nail.

5. CARDIOVASCULAR SYSTEM:

(a) Heart — Structure of Heart. Location of Heart. Blood Supply to Heart.
(b) Blood Vessels — Main blood vessels arising & entering the heart. Types of blood vessels with examples.

6. ELEMENTARY SYSTEM: Name and structure of different parts of elementary system and their inter relationship.

7. URINARY SYSTEM: Name and structure of organs of urinary system and their inter-relationship.

8. REPRODUCTIVE SYSTEM: Male and Female reproductive systems. Name, structure and association of the organs.

9. ENDOCRINE SYSTEM:

(a) Pituitary gland — structure and relation to hypothalamus.
(b) Thyroid gland — structure.
(c) Adrenal gland — structure.

10. NERVOUS SYSTEM: Introduction: Cells of Nervous System (Neuron), Accessory cells of N.S. and Organisation of N.S.

Part A  Pharmaceutical Mathematics   Marks 40

1. ALGEBRA:
   (b) Solution of Linear and Quadratic Equations. Equations reducible to Quadratic Form. Solution of simultaneous Equations.
   (c) Arithmetic, Geometric and Harmonic Progressions. Arithmetic, Geometric and Harmonic Means.
   (d) Permutations and Combinations
   (e) Binomial Theorem: Simple application.


3. ANALYTICAL GEOMETRY: Coordinates of point in a plane. Distance between two points in a plane. Locus, Equations of straight line, Equation of Parabola, Circle and Ellips.


5. INTEGRAL CALCULUS: Concept of Integration. Rules of Integrations. Integrations of Algebraic and Trignomatric functions by using different techniques.

Part B  BIOSTATISTICS   (60 MARKS)


2 ORGANIZING and DISPLAYING DATA: Vriables, Quantitative and Qualitative Variables, Univariate Data, Bivariate Data, Random Variables, Frequency Table, Diagrams, Pictograms, Simple Bar Charts, Multiple Bar Charts, Histograms.

4. CURVE FITTING: Fitting a Straight Line. Fitting of Parabolic or High Degree Curve.

5. PROBABILITY: Definitions, Probability Rules, Probability Distributions (Binomial & Normal Distributions).


8. STUDENT “t”, “F” and Chi-Square Distributions: Test of Significance based on “t”, “F” and Chi-Square Distributions.

9. ANALYSIS OF VARIANCE: One-way Classification, Two-way Classification, Partitioning of Sum of Squares and Degrees of Freedom, Multiple Compression Tests such as LSD, The analysis of Variance Models.